



(43) International Publication Date  
31 March 2005 (31.03.2005)

PCT

(10) International Publication Number  
**WO 2005/028359 A1**

(51) International Patent Classification<sup>7</sup>: **B81B 3/00**,  
G02B 26/08, B81C 1/00

(21) International Application Number:  
PCT/JP2004/014142

(22) International Filing Date:  
21 September 2004 (21.09.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
2003-329845 22 September 2003 (22.09.2003) JP

(71) Applicant (*for all designated States except US*): MAT-  
SUSHITA ELECTRIC WORKS, LTD. [JP/JP]; 1048,  
Oaza-Kadoma, Kadoma-shi, Osaka, 5718686 (JP).

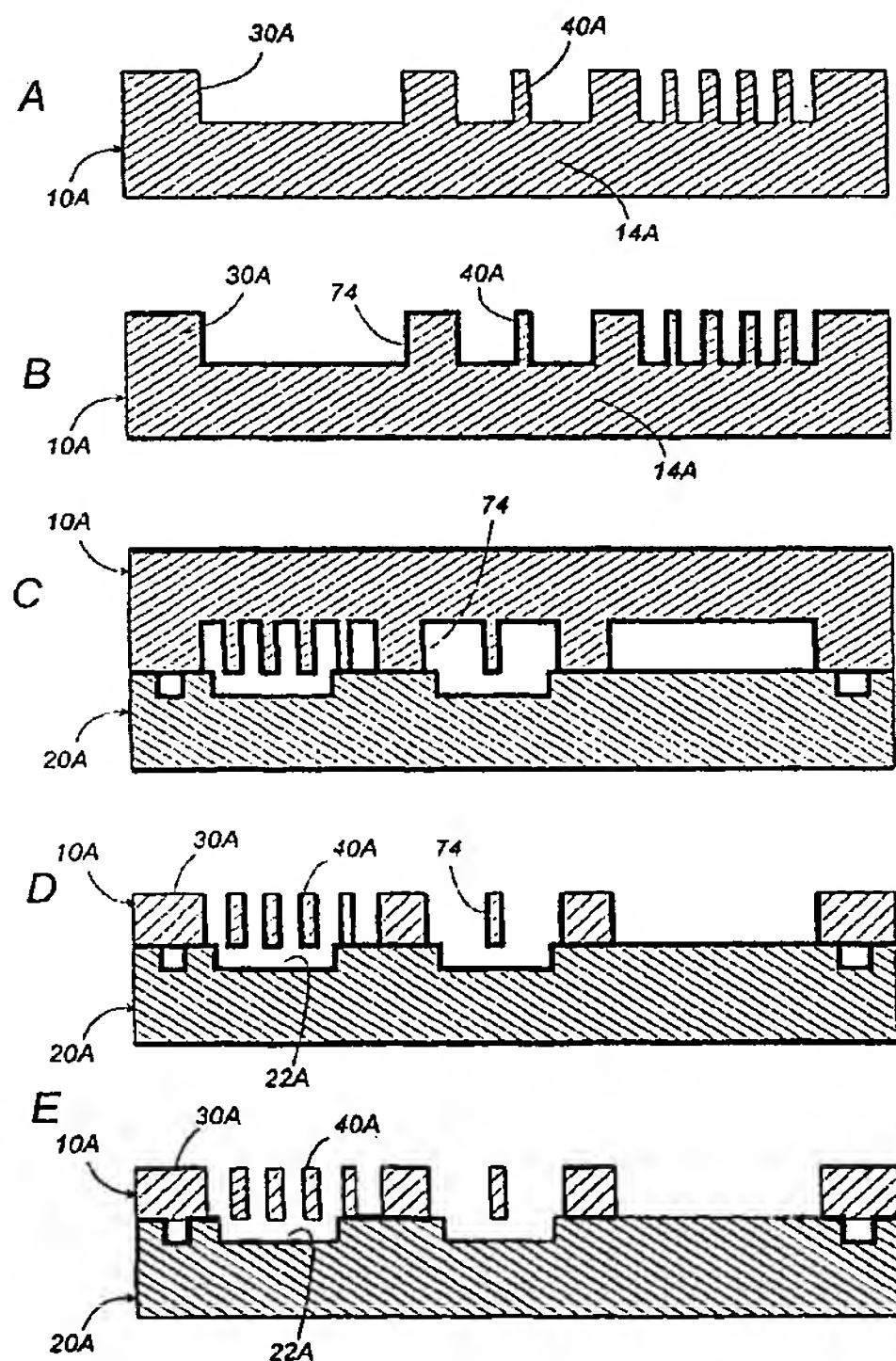
(72) Inventors; and

(75) Inventors/Applicants (*for US only*): OKA, Naomasa  
[JP/JP]; c/o Matsushita Electric Works, Ltd., 1048,

Oaza-Kadoma, Kadoma-shi, Osaka, 5718686 (JP).  
**HARADA, Hiroshi** [JP/JP]; c/o Matsushita Electric  
Works, Ltd., 1048, Oaza-Kadoma, Kadoma-shi, Osaka,  
5718686 (JP). **OGIHARA, Jun** [JP/JP]; c/o Matsushita  
Electric Works, Ltd., 1048, Oaza-Kadoma, Kadoma-shi,  
Osaka, 5718686 (JP). **FUKSHIMA, Hiroshi** [JP/JP]; c/o  
Matsushita Electric Works, Ltd., 1048, Oaza-Kadoma,  
Kadoma-shi, Osaka, 5718686 (JP). **NOGE, Hiroshi**  
[JP/JP]; c/o Matsushita Electric Works, Ltd., 1048,  
Oaza-Kadoma, Kadoma-shi, Osaka, 5718686 (JP).  
**SUZUKI, Yuji** [JP/JP]; c/o Matsushita Electric Works,  
Ltd., 1048, Oaza-Kadoma, Kadoma-shi, Osaka, 5718686  
(JP). **KAWANO, Kiyohiko** [JP/JP]; c/o Matsushita  
Electric Works, Ltd., 1048, Oaza-Kadoma, Kadoma-shi,  
Osaka, 5718686 (JP). **YOSHIHARA, Takaaki** [JP/JP];  
c/o Matsushita Electric Works, Ltd., 1048, Oaza-Kadoma,  
Kadoma-shi, Osaka, 5718686 (JP). **SUZUMURA,**  
**Masahiko** [JP/JP]; c/o Matsushita Electric Works, Ltd.,  
1048, Oaza-Kadoma, Kadoma-shi, Osaka, 5718686 (JP).

[Continued on next page]

(54) Title: PROCESS FOR FABRICATING A MICRO-ELECTRO-MECHANICAL SYSTEM WITH MOVABLE COMPO-  
NENTS



(57) Abstract: A process for fabricating a micro-electro-mechanical system (MEMS) composed of fixed components fixedly supported on a lower substrate and movable components movably supported on the lower substrate. The process utilizes an upper substrate separate from the lower substrate. The upper substrate is selectively etched in its top layer to form therein a plurality of posts which project commonly from a bottom layer of the upper substrate. The posts include the fixed components to be fixed to the lower substrate and the movable components which are resiliently supported only to one or more of the fixed components to be movable relative to the fixed components. The lower substrate is formed in its top surface with at least one recess. The upper substrate is then bonded to the top of the lower substrate upside down in such a manner as to place the fixed components directly on the lower substrate and to place the movable components upwardly of the recess. Finally, the bottom layer of the upper substrate is removed to release the movable components from the bottom layer for floating the movable components above the recess and allowing them to move relative to the lower substrate, while keeping the fixed components fixed to the top of the lower substrate.

Best Available Copy

WO 2005/028359 A1



(74) Agents: NISHIKAWA, Yoshiaki et al.; Hokuto Patent Attorneys Office, Umeda-Daiichiseimei Bldg. 5th Floor, 12-17, Umeda 1-chome, Kita-ku, Osaka-shi, Osaka 5300001 (JP).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.